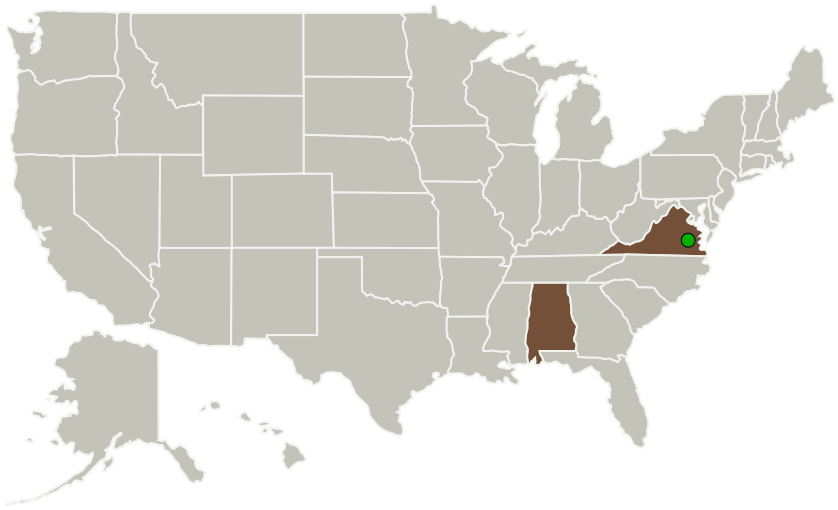
Mesh Generation and Adaption for High Reynolds Number RANS Computations, Phase II

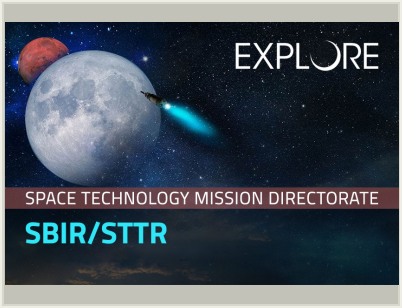
Completed Technology Project (2011 - 2013)

Project Introduction

The innovation of our Phase II STTR program is to develop and provide to NASA automatic mesh generation software for the simulation of fluid flows using Reynolds-Averaged Navier-Stokes codes. As a result of the successful Phase I work, these new tools are now capable of generating high-quality, highly-stretched (anisotropic) meshes in boundary layer regions and transition smoothly to inviscid flow regions, even in an adaptive context. The significance is that our method has the ability to generate a boundary layer mesh while keeping intact the previous adaptation procedures from non viscous simulations. This leads to a natural coupling between boundary layer mesh generation and anisotropic mesh adaptation. All of the Phase I objectives were met and all tasks were completed successfully. The Phase II project will include improvements in surface remeshing, coding for optimal speed and increased robustness of the solvers, adding a mesh optimization module, providing a link to general CAD packages, include unsteady coupling where the boundary layer mesh refinement evolves in time, conduct further validation and verification on NASA models by running flow cases with our solver, documenting the project, and delivering the new meshing software to NASA.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Research South, Inc.	Lead Organization	Industry	Huntsville, Alabama
George Mason University	Supporting Organization	Academia	Fairfax, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

July 2011: Project Start

July 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139083)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Research South, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

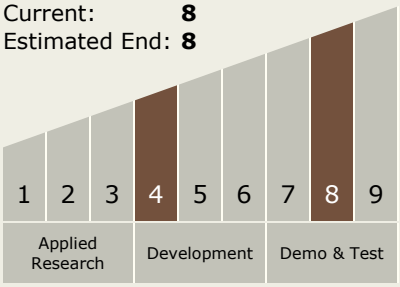
Carlos Torrez

Principal Investigator:

Lawrence W Spradley

Technology Maturity (TRL)

Start: **4**
Current: **8**
Estimated End: **8**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System